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ABSTRACT

Online grocery shopping possesses unique characteristics compared to other online retailers (e.g., multiple decisions per session, different product types, and varied arithmetical complexity). This research investigates the influence of product type (search or experience), arithmetic task complexity, and visual attention to product pictures on attitude toward the website. To test our hypotheses, 32 users participated in a laboratory experiment. Results suggest that visual attention to product pictures has a positive effect on attitude toward the website when shopping for experience goods and that it has a negative effect on attitude toward the website when arithmetic task complexity is high. Theoretical contributions and managerial implications are discussed.

Keywords

Online grocery shopping, experience product, arithmetic complexity, visual attention, attitude toward the site.

INTRODUCTION

In this research project, we conducted a laboratory experiment with 32 participants to investigate two important factors that we suggest have an impact on the decision-making process and consequently on the user attitude toward an online grocery shopping website: i) the type of good being purchased and ii) the mathematical calculation involved in purchasing multiple quantities of an item. Furthermore, we investigate how visual attention on product pictures moderates these relationships.

LITERATURE REVIEW AND HYPOTHESES

Specificity of Online Grocery

While research on online shopping has been mostly focused on single item shopping contexts (e.g. book purchases), online grocery shopping, which is different from the typical online task on several dimensions, has been rarely studied. A first consideration is that, many food items, especially perishable foods, are not sold in standardized weight packages. Consumers are therefore more likely to use fractions and subtractions in online grocery shopping compared to other e-commerce transactions. Additionally, the search and experience good classification (Nelson 1970) is a relevant framing to the grocery shopping experience due to the inability to assess the variable attributes of experience goods before delivery of the product. In order to study online grocery shopping, we need to take into account these unique characteristics and our limited information processing capacity to both evaluate product quality for experience goods and solve mathematically complex purchasing decisions.

Attitude toward the site

The attitude toward a website can be defined as user's "predispositions to respond favorably or unfavorably to web content in natural exposure situations" (Wells et al. 1999). The Theory of Planned Behavior (TPB), proposes a relationship between attitude, intention, and behavior, which has been empirically supported in many contexts (Ajzen 1991). Thus, attitude toward the website is suggested to be important both for theory and practice because it is a behavioral antecedent.

Based on the Technology Acceptance Model (TAM), prior research suggests that perceived ease of use, usefulness, and enjoyment positively influence users'

responses toward a website (Elliott and Speck 2005; Van der Heijden 2003). Furthermore, prior research reports a positive relationship between website product information and attitude toward a website (Chen 1999; Elliott and Speck 2005; Kwon et al. 2002; Yoo and Donthu 2001). Product information can be defined as the amount of information about products and services presented on the website, its accuracy, and format (text, tables, graphs photos, audio, and video) (Elliott and Speck 2005). Finally, a positive relationship between a website's visual attractiveness and the above TAM perceptions has been reported (Van der Heijden 2003).

Product type

When consumers shop online, the type of good influences their shopping behavior. For instance, when consumers shop for an experience good (i.e., a product that is difficult to evaluate before purchase) they spend more time per web page and visit fewer pages per session than consumers shopping for a search good (i.e., a product that can be more easily evaluated before purchase) (Huang et al. 2009). Thus, consumers process information differently when facing different types of products. Weathers et al. (2007) suggest that "the greater the need to use one's senses to evaluate a good, the more experience qualities the good possesses." Goods are defined by their set of attributes, some possess more experience attributes and some others possess more search attributes (Sheffet 1983). In the grocery context, some products are packaged goods (standardized weight, size and quality) and some other products are unpackaged goods (where weight, size, and quality can vary). We suggest that packaged goods (e.g., a can of soup) possess more search attributes whereas unpackaged goods (e.g., apples) possess more experience attributes. In a service context, prior research suggests that perceived risk increases from search to experience services (Mitra et al. 1999). Moreover, in the context of online grocery shopping, unpackaged goods represented on the website (e.g., picture of an apple) are not the actual goods that consumers will receive, increasing their perceived risk (Aljukhadar et al. 2010; Kim et al. 2009; Lee 2009). Perceived risk in e-commerce settings has a negative influence on attitude and intention toward the website (Aljukhadar et al. 2010; Lee 2009).Thus, it is suggested that experience goods will lead to a less positive attitude toward the website than search goods, the former perceived as more risky,

H1 Online shopping of search products leads to a more positive attitude toward the website than online shopping for experience products.

Weathers et al. (2007) note that online retailers need to make product information more vivid by providing pictures in order to help shoppers assess experience products. Thus, product pictures should be more diagnostic for experience goods than search goods. In addition, Peck and Childers (2003) suggest that product pictures can partially compensate for the lack of haptic information when consumers cannot touch products. Prior research suggests that vividness and aesthetically pleasing design elements are positively related to attitude toward a website (Chen 1999; Coyle and Thorson 2001; Kwon et al. 2002; McMillan et al. 2003). Thus, we suggest that consumers' attention on product pictures during their shopping session will moderate the relationship between product type and attitude toward the website. Specifically, we suggest that attention to product pictures will improve consumers' attitude toward the website when shopping for experience products.

H2 Visual attention on product pictures contributes to positive attitude toward the site for experience goods.

Mathematical Complexity

The neuroscience literature suggests that mathematical tasks mobilize higher cognitive functions of our brain. Mathematical complexity can impair self-control. Exertions of working memory may directly affect the active mental representation of an individual's self-control (Hofmann et al. 2012). The capacity to self-regulate to accomplish a goal can affected by a task in which working memory capacity is repeatedly solicited, such as in the case of mathematically complex tasks.

This article hypothesizes that mathematically complex online shopping tasks are likely to influence the attitude toward a merchant website. Garbarino and Edell (1997) found that a task that requires more cognitive effort to evaluate can lead to more negative affect. In online grocery shopping, making complex quantity purchasing decisions (such as deciding the size and quantity of meat portions to buy for dinner) may negatively affect the shopping experience for the consumer. Additionally, consumers that are in a good mood that are exposed to especially negative stimuli may lose their good mood to a neutral or negative mood that may lead them to quit their shopping task (Swinyard 1993). We posit that online shopping tasks involving more complex mathematical operations (such as fractions), number representation (such as decimals), and partial information that needs to be held in memory, should negatively affect users' attitude toward the website.

H3 Arithmetic complexity in online grocery shopping tasks has a negative influence on the attitude toward the site.

When a web-site design does not facilitate information processing, it may cause negative affect. (Chen and Dubinsky 2003). It has been shown that vividness from visual stimuli such as product pictures is effective in improving consumers' understanding of products (i.e., perceived diagnosticity). If consumers believe that a particular website can help them understand and evaluate products, they will form more positive attitudes toward shopping at the website (Jiang and Benbasat 2007). We suggest that due to the lack of purchasing quantity diagnosticity that users can infer from product pictures for arithmetically complex decisions, increased attention on product pictures will lead to a more negative attitude toward the site.

H4 Visual attention to product pictures in arithmetically complex tasks leads to a more negative attitude toward the website.

METHODOLOGY

Sample, Experimental Design and Procedure

The experiment was approved by the Institutional Review Board (IRB) of our institution. Thirty-eight (32) subjects took part in the experiment and 56% were male.

To test our hypotheses, a 2 (Arithmetic complexity) X 2 (Search/Experience goods) within-subject experiment was performed. Each participant completed an experimental session consisting of four (4) randomly ordered online grocery shopping tasks. The first step of each task was to search for the recipe indicated by the instruction sheet on the grocery shopping website. Then, the participant was instructed to go on the website to purchase a predefined selection of products from the recipe. After the shopping task, the participant filled in a questionnaire.

Manipulations and Measures

The manipulations of search/experience and arithmetic complexity were integrated into each shopping task. In the search good condition, participants had to shop for packaged goods such as a spice jar. In the experience good condition, participants had to shop a given quantity of unpackaged goods such as carrots that are sold in bulk and sold by weight. Participants completed a manipulation check question after each online grocery task for arithmetic complexity. A significant difference was observed between noncomplex (M=4.38) and more complex tasks (M=3.09; p <0.001.) Attitude toward the site was measured using Chen and Wells (1999) measurement scale. Visual attention on product pictures was recorded using an eye tracker.

Apparatus, data acquisition, and analysis

A Tobii X-60 (Tobii Technology AB) eye-tracker was used to record subjects' eye movement patterns. On product search pages, areas of interest (AOI) were defined on the product pictures and grouped according to the experimental design (complexity and product type) to generate mean individual fixation durations (seconds) per participant.

To test the proposed hypotheses, a regression analysis with mean fixation durations, arithmetical complexity, and product type as the independent variables and attitude toward the site as the dependent variable was performed. Observations were non-independent, with four (4) consecutive tasks per subject. Therefore, a regression model for repeated measures was performed. A multivariate model was used for regression analysis. The absence of multicollinearity in the model (with search/experience and complexity) was verified and confirmed. Cluster ID regression for repeated measures was conducted with fixation durations as the independent variable and attitude toward the website as the dependent variable (R-square= 0.207, p-value=0.091). RE and MLE regression models yielded similar results. Additionally, we controlled for order among the four tasks and the model shows no significant learning effects (p-value=0.120).

RESULTS

Product type (H1) and arithmetical complexity (H3) were hypothesized to influence attitude toward the site. Results showed no significant relationships (See Table 1). Attitude toward the site was not different between experience goods (mean= 4.28) and search goods (mean=4.32) (p-value=0.201). No difference was observed between arithmetically complex tasks (mean=4.28) and less arithmetically complex tasks (mean=4.33) (p-value=0.199) in terms of attitude toward the site. Thus, H1 and H3 were not supported.

For H2 and H4, it was expected that visual attention on product pictures would have a moderating effect on the relationships proposed in H1 and H3. A panel regression cluster ID (R-squared=0.207, N=123, p-value=0.091) was conducted and results supported H2 and H4 (Table 1). Increased visual attention to pictures of experiential products has a significant positive moderating effect on attitude toward the site

(coefficient=11.82, p-value=0.012). For arithmetically complex tasks, increased visual attention to product pictures has a significant negative effect on attitude toward the site (coefficient= -7.75, p-value= 0.035). This model explains 20.7% of the variance in the attitude toward the site.

Table 1: Moderating effects of visual attention on product pictures for experience product and arithmetically complex shopping tasks on attitude toward the site

Attitude toward the website		
	Mean fixation duration (seconds)	
	Coef.	p-value*
constant	5.57	0
order	0.09	0.120
dummy_exp	-0.80	0.140
dummy_compl	-0.24	0.413
add	7.44	0.074
calc	-0.98	0.443
picture	-12.36	0.016
name	-1.84	0.369
expXadd	-8.03	0.088
expXcalc	-0.51	0.480
expXpicture	**11.82**	**0.012**
expXname	1.18	0.438
complXadd	-2.51	0.295
complXcalc	4.63	0.195
complXpicture	**-7.75**	**0.035**
complXname	6.71	0.128

Notes. *order:* sequence of tasks; *dummy_exp:* experiential products; *dummy_compl:* arithmetically complex tasks*; add:* mean fixation duration on the area where the purchasing quantity is inputted and confirmed; *calc:* mean fixation duration on the area where product unit price, product size, brand and price per weight are listed; *picture:* mean fixation duration on the product picture*; name:* mean fixation duration on the descriptive name of the product; *exp_x*: mean fixation duration on an experiential product area of interest (exp=1); *compl_x:* mean fixation duration on an arithmetically complex task area of interest (compl=1); Regression Cluster ID R-squared=0.207, N=123, p-value=0.091 *one-tail

DISCUSSION AND CONCLUDING COMMENTS

These results make the following theoretical contributions. First, results suggest that online task characteristics do not only influence behavior across web pages (e.g., Huang et al. (2009)), but also within web pages. Specifically, in our study, participants' fixations on product pictures did interact with task characteristics to influence their attitude toward the website. Second, it contributes to the body of knowledge on search-experience product categorization by showing that consumers focus more on product pictures when shopping for experience goods. Third, it contributes to research on the interplay of cognition and affect, by showing that product pictures may also play a moderating role in complex online tasks.

For managers, results underscore the importance of product pictures on websites. For decisions involving experience goods, product pictures may act as an important complementary information source and may be more diagnostic than text description. However, in arithmetically complex tasks, product pictures that are not diagnostic to the quantity being purchased may negatively affect consumers' attitude toward the website. In order to mitigate this effect, retailers need to show product pictures aligned with the decision-making process.

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